## CLAIMS

- 1. Process for production of a sintered oxide ceramic of composition  $Ce_x M_v D_z O_{2-a}$  with dense structure without open porosity or with a predetermined porosity, where a first doping element M is used from at least one element of the group consisting of the rare earths but M ≠ Ce, alkali and earth alkali metals, and a second doping element D of at least one metal but D = M, characterised in that the educts are used with a second doping element D from at least one metal of the group consisting of Cu, Co, Fe, Ni and Mn, in the submicron particle size or as a salt solution, and sintered at a temperature in the range of 750 - 1250°C into an oxide ceramic with extremely fine structure of a grain size of maximum around 0.5 µm.
- Process according to claim 1, characterised in that first doping material M is taken from the group La, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu; Ca, Sr, Ba; Sc, Y, Ga.
- 3. Process according to claim 1 or 2, characterised in that the components are used with mol fractions in the range from  $0.5 \le x \le 1$  for Ce,  $0 \le y \le 0.5$  for M,  $0 < z \le 0.05$  for D, the mol fraction for the second doping element D preferably in the range from  $0.001 \le z \le 0.02$ .
- 4. Process according to any of claims 1 to 3, characterised in that educts are used with a mean grain size in the range of maximum 0.1  $\mu m$ , preferably 0.01 0.05  $\mu m$ .
- 5. Process according to any of claims 1 to 4, characterised in that sintering takes place at a

temperature in the range of  $800 - 1200^{\circ}\text{C}$ , in particular  $850 \text{ to } 1100^{\circ}\text{C}$ .

- 6. Process according to any of claims 1 to 5, characterised in that sintering takes place with a heating rate in the range of 0.5 20, preferably 1  $10^{\circ}$ C/min.
- 7. Process according to any of claims 1 to 6, characterised in that sintering continues until a density of at least around 98% of the theoretically possible density, preferably at least around 99%, is reached.
- 8. Process according to any of claims 1 to 7, characterised in that the educts are sintered with a holding time of at least approximately 0.25 h, preferably around 1 2 h, at the optimum end temperature.
- 9. Process according to any of claims 1 to 8, characterised in that educts in the form of oxides are ground wet and/or dry and calcinated.
- 10. Process according to any of claims 1 to 8, characterised in that the educts are precipitated, filtered and calcinated jointly as inorganic salts.